

## Performance Improvements from Heat Acclimation, Heat Acclimatization

KELVIN O. OBAZUGHANMWEN<sup>1</sup>, RYAN A. DUNN<sup>2</sup>, YASUKI SEKIGUCHI<sup>2</sup>

<sup>1</sup>Sports Performance Laboratory; Department of Kinesiology & Sport Management; Texas Tech University; Lubbock, TX

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Category: Undergraduate

Advisor / Mentor: Sekiguchi, Yasuki (yasuki.sekiguchi@ttu.edu)

### ABSTRACT

Heat acclimation/acclimatization (HA/HAz) are important heat mitigation strategies that help develop heat tolerance from prolonged and repeated exposure to a hot environment, subsequently improving exercise performance in the heat. **PURPOSE:** To assess and quantify the magnitude of performance benefits of short- (STHA), medium- (MTHA), and long-term HA (LTHA) in endurance-trained athletes. **METHODS:** A literature search was conducted in PubMed, SPORTDiscus, Scopus, and Cochrane-Library, with data from 23 studies extracted for analysis. Subgroup analysis distinguished differences in performance and thermoregulatory adaptations between short-, medium- and long-term HA interventions. **RESULTS:** HA produced significant improvements in time trial performance (Effect size [95% confidence intervals] 0.72 [0.42- 1.03]), with LTHA displaying the most significant performance time decrease (-15.29%). MTHA and STHA showed a slight reduction in time trial performance time (-4.28% and -4.40%, respectively). Mean power output during exercise in the heat increased by 7.2% following MTHA, which was greater than STHA (-3.4%). HA showed a significant, *small* reduction in mean resting skin temperature ( $T_{sk}$ ) (0.34 [0.00-0.68]) and core temperature ( $T_c$ ) (0.40 [0.16-0.63]). Subgroup analysis demonstrated that mean  $T_{sk}$  reduction was more significant in the STHA ( $-0.35 \pm 0.32^\circ\text{C}$ ) compared to MTHA ( $-0.24 \pm 0.40^\circ\text{C}$ ), whereas  $T_c$  showed the greatest decrease in temperature from LTHA (0.66 [0.40-0.92]). **CONCLUSION:** Results indicate a noticeable improvement in endurance performances in the heat, with a trend towards longer-duration protocols eliciting the greatest performance adaptations. Findings show that long-term HA/HAz results in improved endurance performance in the heat which is influenced by thermoregulatory adaptations that increase thermal tolerance in hot and humid environments. These findings are important for athletes and their support teams to evidence-inform and individualize HA prescription.